

SIMATIC NET

Industrial Ethernet OSM/ESM Network Management

User Manual

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Important OSM/ESM Functions

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2.1 Autonegotiation

In the autonegotiation mode, an electrical OSM/ESM port sets itself automatically to the transmission rate (10/100 Mbps) of the connected partner device. If the partner device also supports autonegotiation, the devices further negotiate whether they will exchange data in the half-duplex or full-duplex mode and full-duplex flow control.

Note

If an OSM/ESM port that supports the autonegotiation mode is connected to a partner that does not support this mode, the port of the partner device must be set to the half-duplex mode.

2.2 Autocrossover

Electrical OSM/ESM ports with the autocrossover function are capable of crossing over the send and receive signals internally in the port. This means that straight-through or crossover TP cables can be used without causing problems.

To use the autocrossover function:

- At least one of the two ports must support the autocrossover function.
- The autonegotiation mode must be set on the port providing the autocrossover function.

OSM TP22, ESM TP40 and all OSMs/ESMs with order numbers ending in "10" (for example, 6GK1105-2AA10) provide autocrossover functionality.

Notice

Please note that even when using straight-through cables, an invalid loop can result in the Ethernet network, for example, by linking two ports on one OSM/ESM. Such a loop can lead to network overload and network failures.

2.3 Transmission Rate and Duplicity

The transmission rate and/or duplicity of the electrical ports can also be set by the user with network management functions. The values are shown in Table 2-1 below.

The transmission rate and duplicity of a port set by the user only comes into effect if autonegotiation is turned off for the port.

Table 2-1 Transmission Rate and Duplicity

Ports	Transmission Rate	Duplicity
Electrical ports	10 or 100 Mbps	Half duplex or full duplex
Optical ports	only 100 Mbps	Only full duplex

2.4 Factory Defaults and Protected Settings

Defaults

The OSM/ESM had default settings made in the factory (see 4.7.3Factory Defaults). The user can query and modify these defaults with WBM, the CLI or SNMP.

The screenshots of the WBM dialogs in Chapter 4 show the default settings. You will find further default settings in the private MIB file (see Section 4.7.3).

Restore Memory Defaults and Restart

Using WBM or the CLI, a command is available with which it is also possible to restore some of the factory defaults.

Apart from the protected settings, all the settings are restored to the factory setting.

Protected Settings

The protected settings of the OSM/ESM are not modified when you restore the factory defaults to avoid having to make settings again unnecessarily.

The protected settings are as follows:

IP address, subnet mask, default gateway, system name, system location, system contact.

Restore Factory Defaults

Using WBM or the CLI, a command is available with which it is also possible to restore the factory defaults. The factory defaults are also restored if you trigger a RESET with the button on the front panel of the OSM/ESM, see /1/.

The protected settings are also reset!

If you trigger the function using the CLI or WBM, the device does not start automatically. You will be prompted to start the device manually. Before you start manually, you have the opportunity of reconfiguring the device. To be able to communicate with the device later over the LAN, it is important to specify the IP address.

Notice

If the device operates as standby master or standby slave, and the user configuration of the linking signal lines does not match the default factory setting, make sure that you disconnect the signal line(s) before starting the "Factory Default" function.

2.5 Filtering Database (FDB Table)

The FDB (Filtering Database) table is used by the OSM/ESM to decide which port or ports a received packet is transferred to. The FDB table of the OSM/ESM can hold up to 7000 addresses.

2.5.1 Entries in the FDB Table

The FDB table contains two types of entries (addresses):

- Static MAC addresses: These can be entered and deleted by the user with WBM or SNMP.
- Learned MAC addresses: These are learned by the OSM/ESM automatically; in other words they are entered in the FDB table when the module receives corresponding packets. The OSM/ESM makes an entry in the FDB table indicating the port at which it learned the address; in other words, the port to which the node with the corresponding MAC address is connected. After making this entry, it then passes all received packets for this node to the relevant port. This mechanism reduces network load. Automatic learning is only possible when **lock disabled** is set for the relevant OSM/ESM port, see Section 2.6. This is the default setting.

Note

- The OSM TP22 and ESM TP40 do not support static entries in the FDB table.
 - Static addresses are retained when the OSM/ESM is turned on and off or restarted; learned addresses are deleted.
 - In the redundant manager (RM) mode, no static address entries are possible.
 - No static unicast addresses can be entered for the ring ports.
 - If a port is used for a redundant network link (master and standby link), there must be no static addresses entered for it.
-

2.5.2 Displaying and Deleting FDB Entries, Aging

The entries in the FDB table can be displayed by the WBM, see Section 4.10.1. Static addresses can also be entered or deleted in WBM.

If **aging** is activated (default), a **learned** entry (address) is automatically deleted in the FDB table when no packet with this source address is received within the **aging time**.

Aging prevents addresses that are no longer up to date from remaining in the FDB table permanently. “Aged entries” can, for example, mean that a node that has been connected to a different OSM/ESM port is no longer obtainable because the packets intended for it are still sent to the original port.

In WBM and in the CLI, aging can be enabled and disabled and the aging time can be modified. The default setting for the aging time is 40 seconds.

2.5.3 Reaction to Spanning Tree Frames

When an OSM/ESM is interfaced to a higher-level office network, users often require this interface to be implemented redundantly. The company network, however, uses third-party components that do not support fast OSM/ESM redundancy mechanisms (forming rings and standby links). At other points in the office network, a mesh topology is used and the resulting loops are eliminated by the spanning tree protocol (IEEE 802.1D).

As of firmware version 2.3.5, OSMs/ESMs are capable of evaluating spanning tree frames that report modified configurations in the office network. This allows an OSM/ESM ring to interface redundantly with an office network based on spanning tree.

During configuration changes (triggered by topology change events) made in a connected spanning tree office network, an OSM/ESM reduces its aging time. As a result, the MAC addresses of all stations (for example PCs) from which no further frames are received during this shortened time are removed from the address table. Stations that use new or modified network paths following a change in the configuration can therefore be reached again more quickly. On completion of the configuration changes, the OSM/ESM changes back to normal operation.

Note

The OSM/ESM passes on all spanning tree frames regardless of the function described above. The OSM/ESM itself does not send any spanning tree frames.

The times involved in configuration changes depend on the spanning tree configuration and the network topology. The actual time required to change the configuration must be determined based on tests.

During modification of a configuration, "Configuration BPDUs" (configuration frames) with the "TC" Flag ("topology change" bit) set are sent repeatedly in a connected spanning tree network. Based on these frames, an OSM/ESM recognizes the duration of the changes to the configuration.

2.6 Locked Ports

Locking

Locking is used to make sure that only packets from authorized stations are passed on by the OSM/ESM.

Lock Enabled

If the **lock enabled** function is activated for an OSM/ESM port, the OSM/ESM only passes on packets received at this port if the source address exists in the FDB table. All other packets are discarded. Learning new addresses is also disabled on this port; in other words, if a packet with a new source address is received, this address is not included in the FDB table of the OSM/ESM.

Addresses that have already been learned, are deleted automatically if aging is activated (see Section 2.5.2). A restart will force all learned addresses to be deleted immediately.

Lock Disabled

If **lock disabled** (default setting) is set, the OSM/ESM passes on packets with an unknown source address received at a port (in other words an address that does not exist in the FDB table of the OSM/ESM). New source addresses are automatically learned on this port; in other words, they are entered in the FDB table.

Programming Authorized Nodes

If you only want the packets from certain authorized nodes to be passed on by the OSM/ESM, follow the steps outlined below:

1. Enter the MAC addresses of these nodes and the number of the port to which they are connected in the FDB table of the OSM/ESM using WBM.
2. Set the port to **lock enabled**.
3. Run an OSM/ESM restart using WBM to delete the learned entries in the FDB table and to save the configuration. The static addresses in the FDB table are retained when you restart.

Note

- The ring ports cannot be configured with Lock enabled.
 - If a port is used for a redundant network link (master and standby link), it must not be configured with Lock enabled.
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2.7 Mirroring

Mirroring for Diagnostics

Mirroring allows you to mirror (copy) the bi-directional data traffic to an OSM/ESM port (mirrored port) to another OSM/ESM port (monitor port) and to record it with a protocol analyzer for diagnostic purposes.

Settings

You can set the mirrored and monitor port and activate the mirror function both with the command-line interface or using WBM. Ports 1 to 6 of the OSM/ESM can be used as the monitor port.

With the OSM TP22 and ESM TP40 variants, only ports 1 and 2 are permitted as the monitor ports.

Mirroring Active

If the mirroring function is activated and if the monitor port has a valid connection to the attached protocol analyzer, the port LED of the monitor port on the OSM/ESM flashes quickly (4 x short with pause).

Note

Please remember to turn off the mirroring function if you connect a normal DTE to the monitor port.

2.8 Traps

Trap Messages

If certain events occur, the OSM/ESM can generate (SNMP) trap messages and send them to up to 10 different nodes, for example management stations. By configuring the management station, the traps can be displayed on the user interface. An interpreted display is possible only when the corresponding MIB files can be evaluated by the management station. For example, to obtain a plain language display of special OSM/ESM functions, the private OSM/ESM MIB file must be loaded (see Section 4.7.3).

Issuing Traps

If the trap function is activated, traps are issued by the OSM/ESM automatically in the following situations:

Standard Traps (RFC 1157)

- After powering up or restarting.
- At link up, link down; in other words, when the valid connection to the DTE at a port is interrupted or reestablished.
- If an SNMP authentication error occurs; in other words, when a network management station or the Internet browser attempts to access the OSM/ESM using SNMP requests with the wrong access permission (community name).

RMON Traps (RFC 1757)

- When certain limit values are violated (high, low) that were configured earlier on the OSM/ESM by a network management station using RMON.

OSM/ESM-Specific Traps

- When the OSM/ESM ring is opened/closed by the redundancy manager (OSM/ESM in the RM mode), see /1/.
- When there is a switchover between the standby master and standby slave in a redundant coupling, see /1/.
- If the error state changes, see /1/.
- When one of the two power supplies of the OSM/ESM is turned on or off during operation.

Enabling/Disabling Traps

The issuing of traps can be enabled or disabled by WBM or the command-line interface.

2.9 E-Mail Function

The OSM/ESM has an E-mail function with which an E-mail can be sent automatically (for example to the network administrator) if an alarm occurs. If the E-mail function is activated, the OSM/ESM sends an E-mail in the same situations that lead to a trap being issued (see Section 2.8). The E-mail includes the identification of the sending OSM/ESM and a description of the cause of the alarm in plain language. For networks with only a few nodes, this allows simple centralized network monitoring to be implemented on the basis of an E-mail system. When an E-mail fault message arrives, the WBM can be started by the browser based on the identification of the sender so that further diagnostic information can be obtained.

To use the E-mail function, the following requirements must be met:

- The E-mail function is activated on the OSM/ESM and the E-mail address of the recipient is configured.
- The E-mail function is activated for the particular event (event configuration, activated for all events as default).
- There is an SMTP server in your network that can be reached by the OSM/ESM.
- The IP address of the SMTP server is entered on the OSM/ESM.

The E-mail function can be activated by WBM or the command-line interface.

Note

Depending on the properties and configuration of the SMTP server, it may be necessary to adapt the "From" box for the E-mails. Please check with the administrator of the SMTP server. You can specify the "From" box using WBM, CLI or by direct SNMP access.

Unless modified, the OSM/ESM uses the following address:

`<device_type>@<IP_address>`

For example, OSM_ITP62@192.168.0.10

2.10 Event Log Table

Events are entered chronologically in the event log table (log book) of the OSM/ESM.

The events include:

- all events reported, including those via E-mail and trap,
- additional error messages if an E-mail server (SMTP) is not accessible or rejects the E-mail of an OSM/ESM.

The event log table can be read out using the command line interface (see section 3.5) over the Web Based Management (see Section 4.7.5) or using direct SNMP access. It can hold a maximum of 200 entries. When the number of entries reaches 201, the oldest entry is deleted (ring buffer).

2.11 Time of Day and Time-of-day Synchronization

The OSM/ESM has two times:

1. **System Up Time:**
The time since the OSM/ESM was last restarted. The system up time is added to every E-mail and every entry in the event log table. After 497 days, the system up time starts again at 0. This overflow results from the range of values of the standard MIB object (OID 1.3.6.1.2.1.1.3).
2. **Date and Time of Day:**
The date and time of day can be set on the OSM/ESM either manually using a CLI command or automatically using SIMATIC time-of-day frames. Once the date and time of day have been set after restarting the device, the date and time-of-day information is added to E-mails and every event in the event log table. The date and time of day are NOT buffered if the device is turned off.

The OSM/ESM evaluates the cyclic multicast frames of a SIMATIC time transmitter and sets the date and time of day accordingly. This allows an absolute time to be assigned to reported events.

2.12 Flow Control

Flow control is a mechanism that reduces the risk of data loss in the network resulting from overload.

The OSM/ESM supports two flow control mechanisms:

- **Half Duplex Flow Control (Back Pressure)** for ports operating in the half duplex mode. With this type of flow control, the OSM/ESM reduces the packet rate received at a port if there is overload in the network by generating additional collisions.
- **Full Duplex Flow Control** complying with the IEEE 802.3x standard for ports operating in the full duplex mode. If there is overload, the OSM/ESM generates pause packets that stop or re-enable the sending of new packets by the connected partner device. This is only possible when the DTE supports full duplex flow control.

Half and full duplex flow control can be activated separately for each port of the OSM/ESM. If the OSM/ESM port is operating in the autonegotiation mode, the devices automatically negotiate whether or not the full duplex flow control is activated. It is also possible to deactivate flow control for all ports of the OSM/ESM at the same time.

Note

As default, full duplex flow control is deactivated. If you activate this, remember that this can delay time-of-day synchronization frames.

2.13 BOOTP/DHCP

If there is a BOOTP or DHCP server in your network, the OSM/ESM can automatically obtain the following from the server:

- the IP address,
- the subnet mask,
- the IP address of the default gateway,
- the IP address of the TFTP server,
- the configuration file (Section 2.17) / or the firmware file name

If the BOOTP/DHCP function is activated on the OSM/ESM (default), BOOTP and DHCP are always started after starting up the device.

BOOTP and DHCP can only be activated/deactivated together. When started, the OSM/ESM sends both BOOTP and DHCP frames. If a BOOTP and a DHCP server reply in the network, the DHCP server will be given priority by the OSM/ESM.

Note

The BOOTP/DHCP process delays the startup of the device by approximately 40 seconds if the BOOTP/DHCP server is not obtainable. For this reason, BOOTP/DHCP is deactivated as soon as an IP address is set using WBM, CLI, direct SNMP access or the Primary Setup Tool.

Note

DHCP provides a mechanism that allows a client to lease an IP address for a limited lease time. When the lease time expires, the OSM/ESM can no longer be contacted using its previous IP address. If you use DHCP, please check the (default) settings of the DHCP server regarding the lease time.
